Potential Contributions of the Burden of Disease and Injury to Assess Community Health in Indian Country

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Outline

- Introduction
- Mortality disparities
- Burden of disease and injury
- Major risk factors
- Research challenges

Key Questions and Indicators for Human Health - EPA Strategic Plan 2003-2008

- What are the trends in health status ?
- What are the trends in human disease and condition for which environmental pollutants may be a risk factors including across population sub-groups and geographic regions ?

- Indicators:
  - Health Status (mortality and life expectancy)
  - Human Disease and Condition (incidence and prevalence)
  - Human Exposure to Environmental Pollutants (measured blood levels)

Mortality Disparities

Eight Americas: Investigating Mortality Disparities across Races, Counties, and Race-Counties in the United States

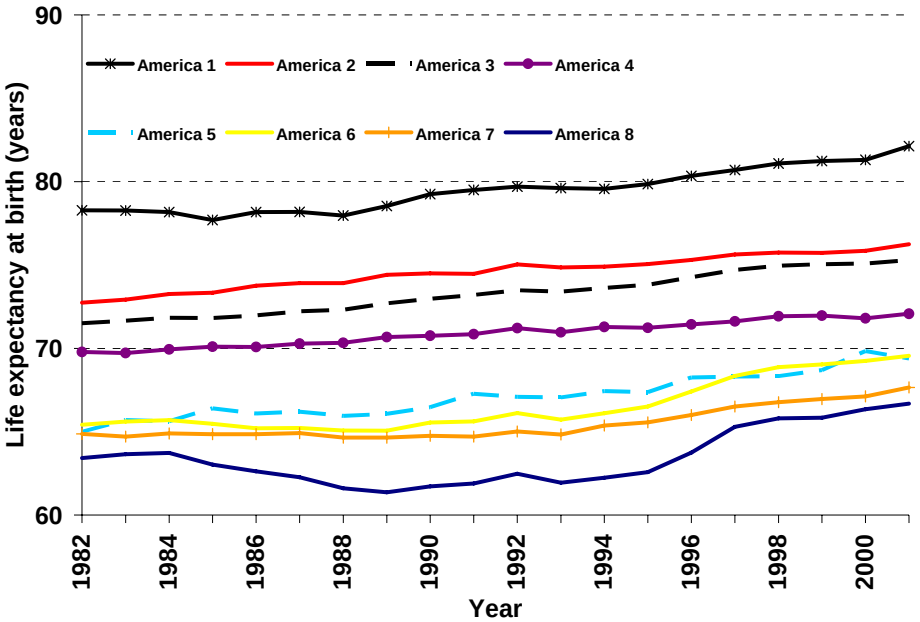
Definitions and Basic Sociodemographic Characteristics of the 8 Americas

8 subgroups based on a small number of socio-demographic and geographical variables

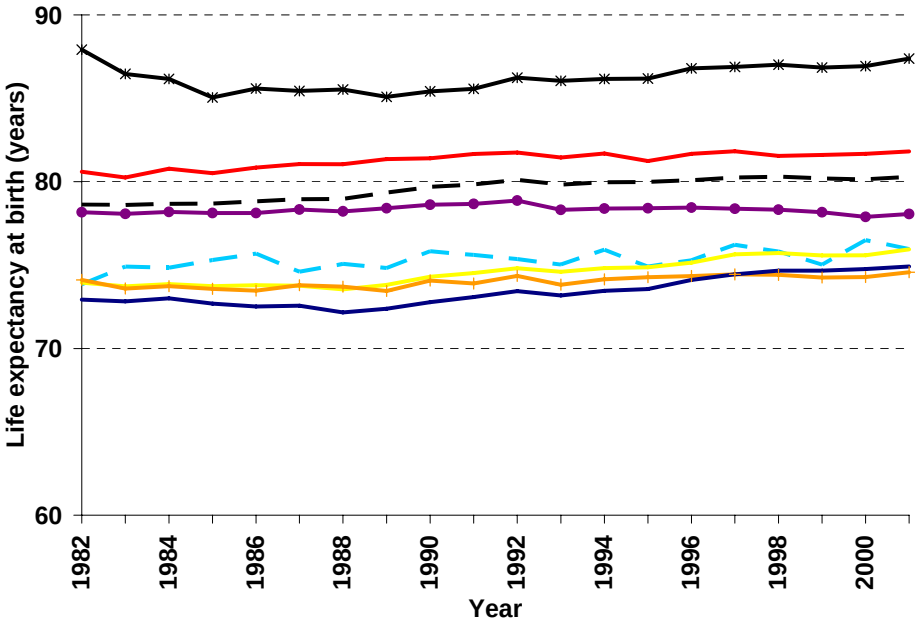
1. Asian
2. Northland low-income White
3. Middle America – *All other Whites, Asians and Native Americans not included elsewhere.* Pop: 214 million; average income per capita: $24,640;percent completing high school: 84%.
4. Low-income whites in Appalachia and the Mississippi Valley
5. Western Native American - *Native American population in the mountain and plains areas predominantly in reservations (359 counties)* Population: 1 million; average income per capita: $10,029; percent completing high school: 69%
6. Black Middle America
7. Southern Low-income rural Black
8. High-risk urban Black

Trends in life expectancy

Males



Females



8 Americas: Disparities in Mortality across Race-Counties in the United States: Key Findings

- Disparities in life expectancy are large and cannot be explained by race, income, or basic health-care access and utilization alone
- Health disparities cannot be explained by a single cause of death such as homicide or HIV
- Mortality disparities are most concentrated in young and middle-aged males and females. They result from a number of chronic diseases with well established risk factors
- Policies aimed at reducing fundamental socioeconomic inequalities are currently practically absent in the US
- Health disparities will have to be at least partly addressed through public health strategies that reduce risk factors for chronic diseases and injuries

Burden of Disease and Injury

Disability Adjusted Life Year (DALY)

- Metric to measure population health developed for the Global Burden of Disease Study to identify the relative magnitude of diseases, injuries and risk factors

  - DALYs = YLL + YLD

YLL: years do life lost to premature death

YLD: years lost to disability from non-fatal conditions

Inputs into the DALY Metric

- Information on age specific mortality and the epidemiology of non-fatal health outcomes
- Information on the value attached to various health states relative to ideal health or death
- Inclusion of other social values

Global Burden of Disease Studies

- Global Burden of Disease and Injury 1990
- Global Burden of Disease and Risk Factors 2001
- Burden of Disease and Injury: update for 2001

Burden of Disease and Injury in the United States 1996

Objectives:

- Incorporate **non-fatal conditions** in health assessments
- Develop a comprehensive set of **internally consistent estimates** for major health conditions
- Quantify **intra-country differentials in health outcomes** by age, gender, and race
- Place the United States public health situation in a **global context**

Key Findings: Ten Leading Causes of Deaths and DALYs

DALYs [*million* (%total)]

1.	Ischemic heart disease	3.13 (9.5)
2.	Cerebrovascular diseases	1.51 (4.6)
3.	*Motor vehicle accidents*	1.39 (4.2)
4.	Lung cancer	1.37 (4.1)
5.	COPD	1.25 (4.1)
6.	*Alcohol use*	1.14 (3.8)
7.	*HIV/AIDS*	0.96 (2.9)
8.	Diabetes mellitus	0.95 (2.9)
9.	*Osteoarthritis*	0.94 (2.8)
10.	Dementia/ CNS disorders	0.89 (2.7)

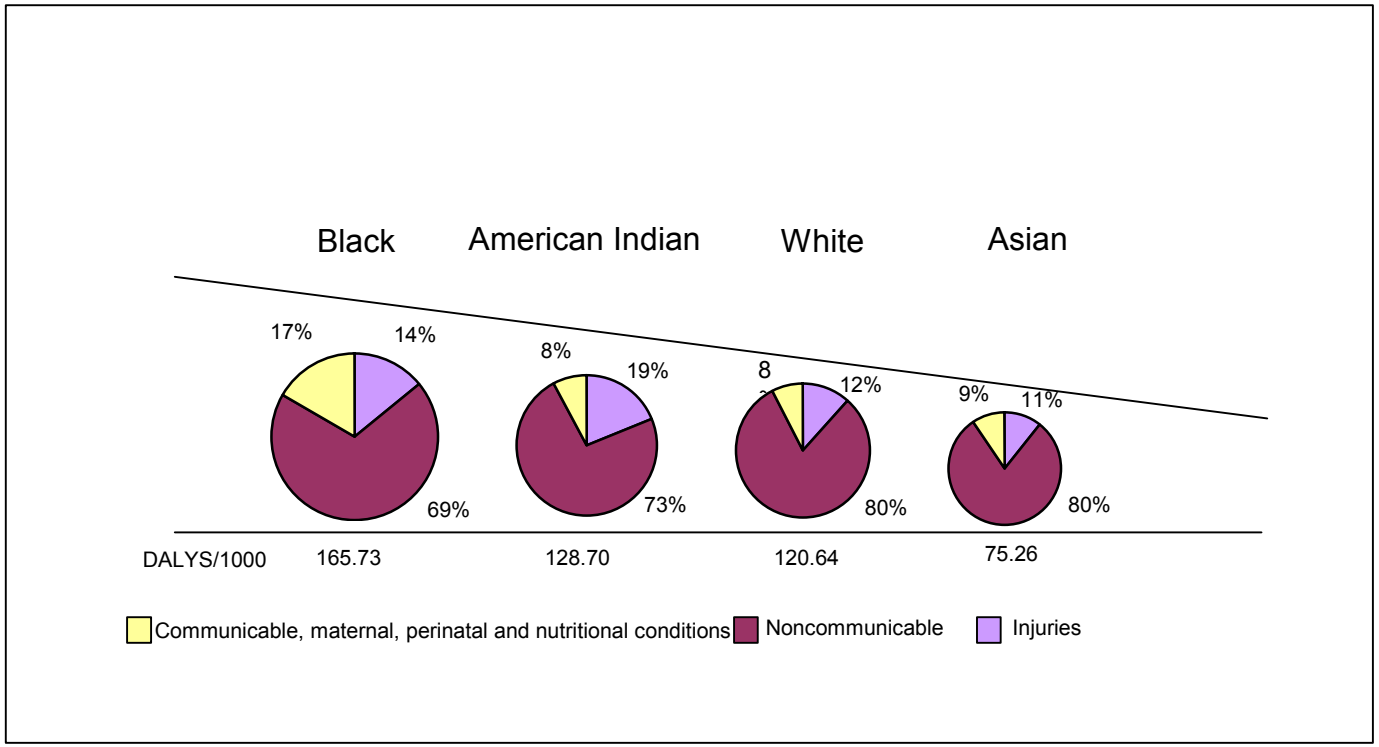
Total DALYs **33.1**

Deaths [*million* (%total)]

1.	Ischemic heart disease	0.53 (23.2)
2.	Lung cancer	0.17 (7.3)
3.	Cerebrovascular diseases	0.16 (7.0)
4.	COPD	0.10 (4.3)
5.	Lower respiratory infections	0.84 (3.6)
6.	Diabetes mellitus	0.63 (2.7)
7.	Cancer of colon or rectum	0.61 (2.6)
8.	Breast cancer	0.47 (2.0)
9.	*Motor vehicle accidents*	0.44 (1.9)
10.	Dementia/CNS	0.43 (1.9)

Total Deaths **2.31**

Groups I, II and III as a percentage of total burden of disease (DALY) by race, US 1996



Leading Causes of DALYs by Race

WHITE (% total)	**BLACKS** (% total)	**AMERICAN INDIANS** (% total)	**ASIANS** (% total)
Ischemic heart disease (10.2)	HIV/AIDS (7.7)	**Alcohol use (15.8)**	Unipolar major depression (7.4)
Cerebrovascular disease (4.5)	Ischemic heart disease (6.7)	**Motor vehicle accidents (7.8)**	Ischemic heart disease (5.3)
Lung cancer (4.4)	Homicide and violence (6.1)	**Ischemic heart disease (5.0)**	Cerebrovascular disease (4.6)
Motor vehicle accidents (4.3)	Cerebrovascular disease (4.8)	**Unipolar major depression (4.0)**	COPD (4.0)
Unipolar major depression (4.3)	Alcohol use (4.2)	**Cirrhosis of the liver (3.2)**	Osteoarthritis (4.0)

Five Leading Causes of YLL and YLD among American Indians

- Male

YLL

1. Motor vehicle accidents (16.3%)
2. Ischemic heart disease (10.5%)
3. *Self inflicted injury (7.7 %)*
4. *Homicide and violence (6.3%)*
5. Cirrhosis of the liver (4.8%)

YLD

1. Alcohol use (29.7%)
2. Unipolar major depression (5.4%)
3. *Drug use (3.9%)*
4. Osteoarthritis (3.8%)
5. Asthma (3.5%)

- Female

YLL

1. Motor vehicle accidents (11.7%)
2. Ischemic heart disease (7.8%)
3. Cirrhosis of the liver (6.0%)
4. Diabetes mellitus (5.4%)
5. Cerebrovascular disease (3.8%)

YLD

1. Alcohol use (24.7%)
2. Unipolar major depression (9.7%)
3. Asthma (4.1%)
4. Osteoarthritis (3.8%)
5. COPD (3.4%)

Potential Applications of DALYs

- Providing appropriate and balanced attention to the effects of non-fatal health outcomes on overall population health
- Comparing the health of one population with that of another
- Monitoring changes in the health of a given population
- Identifying and quantifying overall health inequalities within populations
- Monitoring changes in the health of a given population

- Informing debates on priorities for health service delivery and planning
- Informing debates on priorities for research and development
- Analyzing the benefits of health interventions for use in cost-effectiveness analysis

Burden of Disease due to Major Risk Factors

Disease Burden from Risk Factors

The relative importance of risk factors as a fraction of the total impact is critical in deciding the distribution of available and always scarce resources for interventions

Comparative Risk Assessment Framework (CRA) - 2001

- Provides a unified framework for describing population exposure to risk factors and their consequences for population health. It is an important step in linking the growing interest in the causal determinants of health across a variety of disciplines

- Applies knowledge about hazards posed by risk factors from epidemiological research to data on exposure in the broader population

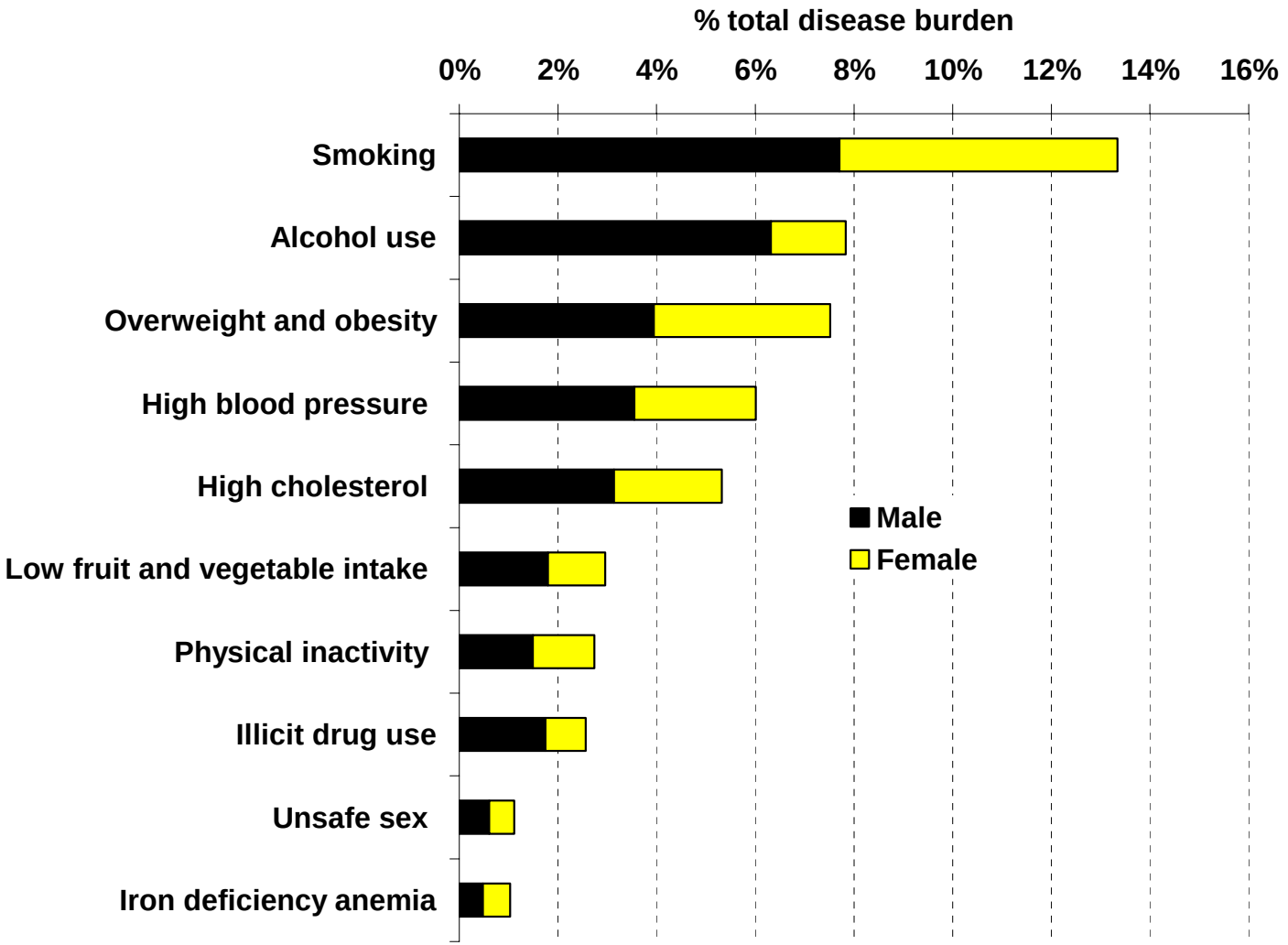
- Risk assessment aims at mapping the alternative population health scenarios that arise from changes in the distribution of risk factors (counterfactual distribution):

  Quantifies changes in mortality or disease burden that would be expected if the population distribution of exposure to a risk were changed to an alternative (counterfactual) distribution.

  For comparability the counterfactual exposure distribution was defined as the distribution that would lead to the lowest levels of disease burden.

  For some risks, limitations of exposure or relative risk data limited complete comparability of counterfactuals across risk factors.

Burden of Disease Attributable the Ten Leading Risk Factors



Environmental Risks included in Comparative Risk Assessment

- Unsafe water, sanitation and hygiene
  - Diarrheal diseases
- Urban air pollution
  - Trachea, bronchus and lung cancer
  - Chronic obstructive pulmonary disease
  - Ischemic heart disease, stroke
- Indoor smoke from household use of solid fuels
  - Lower respiratory infections
  - Chronic obstructive pulmonary disease

Disease Burden Attributable to Combined Hazards of Multiple Risk Factors

- Some cases of disease are caused by **multiple risk factors** because the effects of more distal risk factors (poverty) are mediated through more intermediate ones (IAP) and because

- **Risks act in combination** with one another:

  e.g. child mortality as a result of IAP is particularly high among malnourished children without access to health services

- Multicausality also means that a range of interventions can be used for disease prevention, with the specific choice determined by factors such as cost, available technology and cultural preferences.

Summary - Inputs into Strategies for Improving Population Health

- Detailed descriptions of the level and distribution of diseases and injuries
- Reliable and comparative analysis of risks to health
- Intervention cost-effectiveness

Data Needs

Burden of disease analysis

- Deaths registration
- Disease registers
- Epidemiological studies
- Health surveys
- Health facility data

Risk factor analysis

- Population attributable fraction of selected risk factors and combined hazards of multiple risks

Research Challenges

Major Research Challenges

- Apply burden of disease analysis and CRA framework to estimate the distribution and magnitude of major caused of disease burden for Native Americans and selected Indian Tribes
- The systematic analysis of burden of disease will provide the evidence based needed to
  - Inform debates on priorities for health service delivery and planning
  - Inform debates on priorities for research and development
  - Analyze the benefits of health interventions for use in cost-effectiveness analysis

Thank you very much